

Remarks

Claims 1-4, 6-13, 15-23, 25-32, 34-39, and 41 are pending in the subject application. By this Amendment, Applicants have canceled claims 6, 7, 25, and 26, and have amended claim 41. Support for the amendments can be found throughout the subject specification and in the claims as originally filed. Applicants respectfully submit that the amendments presented herein will require no further search or examination on the part of the Examiner and do not constitute new matter. Entry and consideration of the amendments presented herein is respectfully requested. Accordingly, claims 1-4, 8-13, 15-23, 27-32, 34-39, and 41 are currently before the Examiner. Favorable consideration of the pending claims is respectfully requested.

Claims 6, 7, 25, and 26 are rejected under 35 USC §112, second paragraph, as indefinite. In one aspect of the rejection, claims 6 and 25 are rejected as indefinite in the recitation of the phrase “reduced inhibition by maltose.” In addition, claims 7 and 26 are rejected as indefinite in the recitation of the phrase “increased thermostability.” Applicants respectfully assert that the claim language is clear and does not render the claims indefinite. As Applicants have previously noted, the subject specification discloses two references that teach a β -amylase protein that exhibits reduced inhibition by maltose. An ordinarily skilled artisan having read the subject specification understands the meaning of reduced inhibition by maltose and increased thermostability of β -amylase as recited in the claims. However, by this Amendment, Applicants have canceled claims 6, 7, 25, and 26. Thus, the rejection of these claims is moot. Accordingly, reconsideration and withdrawal of the rejections under 35 USC §112, second paragraph, is respectfully requested.

Claim 41 is rejected under 35 USC §112, second paragraph, as indefinite in the recitation of the phrase “breeding a plant.” The Examiner asserts that the claim language is confusing on the grounds that it is unclear how a plant tissue or plant cell is bred. The Examiner also asserts that it is unclear whether the plant, plant tissue, or plant cell comprises the polynucleotide. Applicants respectfully assert that the claim is not indefinite and it is clear from the specification that the progeny plant comprises a polynucleotide of the invention. However, by this Amendment, Applicants have amended claim 41 to delete reference to “plant tissue” or “plant cell” and to recite that the progeny plant comprises the polynucleotide. Accordingly, reconsideration and withdrawal of the rejection under 35 USC §112, second paragraph, is respectfully requested.

Claims 6, 7, 25, and 26 are rejected under 35 USC §112, first paragraph, as nonenabled by the subject application and as lacking sufficient written description. The Examiner asserts that the subject specification does not enable or provide written description for amylase enzymes that are thermostable or that exhibit reduced inhibition by maltose. Applicants respectfully assert that the subject specification does enable and does provide adequate written description of the claimed invention. As Applicants have previously noted, the subject specification discloses two references that teach a β -amylase protein that exhibits reduced inhibition by maltose. However, as noted in regard to the rejection under 35 USC §112, second paragraph, claims 6, 7, 25, and 26 have been canceled. Thus, the rejection of these claims is moot. Accordingly, reconsideration and withdrawal of the rejection under 35 USC §112, first paragraph, is respectfully requested.

Claims 1-4, 7-11, 15-21, 23-30, 34-39, and 41 are rejected under 35 USC §103(a) as obvious over Gausing *et al.* (U.S. Patent No. 5,498,832) in view of Seki *et al.* (2001). In addition, claims 1-4, 8-13, 15-23, 25-32, 34-39, and 41 are rejected under 35 USC §103(a) as obvious over Gausing *et al.* (U.S. Patent No. 5,498,832) in view of Seki *et al.* (2001) and Grover *et al.* (2001). The Gausing *et al.* patent is cited as teaching a transgenic plant (potato or rice) and a method of producing the transgenic plant comprising introducing a polynucleotide encoding α -amylase, operably linked to a promoter that drives the increased expression of the α -amylase coding region. The Seki *et al.* reference is cited as teaching increased expression of a β -amylase gene in a plant in response to cold stress. The Grover *et al.* reference is cited as teaching the use of a stress inducible promoter. Applicants respectfully traverse these grounds of rejection.

Applicants respectfully assert that the cited references, whether taken alone or in combination, do not teach or suggest Applicants' claimed invention. Moreover, none of the references cited by the Examiner teach or suggest the use of β -amylase in the enhancement of environmental stress tolerance in plants. The primary reference relied on by the examiner under both of the §103 rejections, the Gausing *et al.* patent, does not teach or suggest enhancement of stress tolerance in a plant, nor the mechanism by which α -amylase could enhance stress tolerance in a plant. At the time of the subject invention, the metabolic pathway by which starch is mobilized by degradation enzymes into monosaccharides and disaccharides in photosynthetic organs had not been determined. These pathways were not described in the scientific literature until well after the filing

and priority date of the subject application (see, for example, publications by Lu and Sharkey, 2004; Lu and Sharkey, 2006; Weise *et al.*, 2004; Zeeman *et al.*, 2004; Zeeman *et al.*, 2007; Niittyla *et al.*, 2004; Chia *et al.*, 2004; and Smith *et al.*, 2005 (copies of which are enclosed with this Amendment). Thus, at the time of the present invention, β -amylase production of maltose was not believed to be involved (or was deemed unimportant) in starch metabolism in plant photosynthetic organs and tolerance to environmental stress conditions by the ordinarily skilled artisan. It is only the subject application that teaches that β -amylase and maltose production have an important function in plant tolerance to environmental stress conditions.

The secondary references cited under the §103 rejections do not cure the deficiencies of the primary reference. The Seki *et al.* reference reports on 19 plant genes that showed higher gene expression at low temperature, one of which was β -amylase. However, nowhere does the Seki *et al.* reference teach or suggest that β -amylase is an important factor in cold stress tolerance in plants. Applicants respectfully assert that simply listing a gene whose expression changes during exposure of the organism to a stress condition is not equivalent to or reasonably predictive of that gene having a direct role in providing the organism with increased tolerance to the stress condition. For example, the change in gene expression in response to a stress condition may not be important for increased tolerance to stress, but rather it may be undergoing change in expression for some unrelated but biologically important reason. The appropriate legal standard for obviousness under §103 requires that the references cited by the Examiner must provide a reasonable expectation of success in arriving at Applicants' claimed invention. In the instant case, the cited references do not provide a reasonable expectation of success.

Moreover, at the time of the Seki *et al.* reference, only genes under the control of DREB1A transcription factor were thought to be potentially important in cold stress tolerance in plants. The Seki *et al.* reference disclosed that β -amylase gene expression was not controlled by DREB1A (see, for example, Figure 4 in the Seki *et al.* reference) and, therefore, an ordinarily skilled artisan would have considered β -amylase to be unimportant and uninteresting in the pursuit of cold tolerance in plants at the time of the present invention. Applicants further note that no other laboratory initiated any further studies of β -amylase and its role in environmental stress tolerance in plants following the Seki *et al.* publication. Thus, Applicants respectfully assert that an ordinarily skilled artisan would

not have had any motivation to combine the teachings of the Seki *et al.* reference with that of the Gausing *et al.* patent. A *prima facie* case of obviousness cannot be established in the absence of some motivation that would suggest to the ordinarily skilled artisan to combine the teachings of the cited references to arrive at Applicants' claimed invention. *In re Geiger*, 2 USPQ2d 1276 (Fed. Cir. 1987).

Applicants further note that the Seki *et al.* reference only describes changes in gene expression following drought or cold stress conditions. Thus, the Seki *et al.* reference does not teach or suggest anything in regard to genes that are expressed in response to heat stress conditions, as is claimed in claims 3 and 22 of the subject application. However, claims 3 and 22 are included by the Examiner within the §103 rejection. Thus, the Seki *et al.* reference is even less relevant to claims 3 and 22. No other secondary references have been cited by the Examiner with respect to teachings pertaining to heat stress.

In view of the above, Applicants respectfully assert that the cited references do not teach or suggest Applicants' claimed invention. As the Examiner is aware, it is well established in patent law that in order to support a *prima facie* case of obviousness, a person of ordinary skill in the art must find both the suggestion of the claimed invention, and a reasonable expectation of success in making that invention, solely in light of the teachings of the prior art. *In re Dow Chemical Co.*, 5 USPQ2d 1529, 1531 (Fed. Cir. 1988). One finds neither the suggestion nor the required reasonable expectation of success in the cited references. Accordingly, reconsideration and withdrawal of the rejections under 35 USC §103(a) is respectfully requested.

It should be understood that the amendments presented herein have been made solely to expedite prosecution of the subject application to completion and should not be construed as an indication of Applicants' agreement with or acquiescence in the Examiner's position.

In view of the foregoing remarks and amendments to the claims, Applicants believe that the currently pending claims are in condition for allowance, and such action is respectfully requested.

The Commissioner is hereby authorized to charge any fees under 37 CFR §§1.16 or 1.17 as required by this paper to Deposit Account No. 19-0065.

Applicants invite the Examiner to call the undersigned if clarification is needed on any of this response, or if the Examiner believes a telephonic interview would expedite the prosecution of the subject application to completion.

Respectfully submitted,



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Attachments: References by Lu and Sharkey, 2004; Lu and Sharkey, 2006; Weise *et al.*, 2004; Zeeman *et al.*, 2004; Zeeman *et al.*, 2007; Niittyla *et al.*, 2004; Chia *et al.*, 2004; and Smith *et al.*, 2005.